http://snap.lbl.gov

Supernova / Acceleration Probe: Science with Wide Deep Fields

The SNAP collaboration

Multiband deep survey

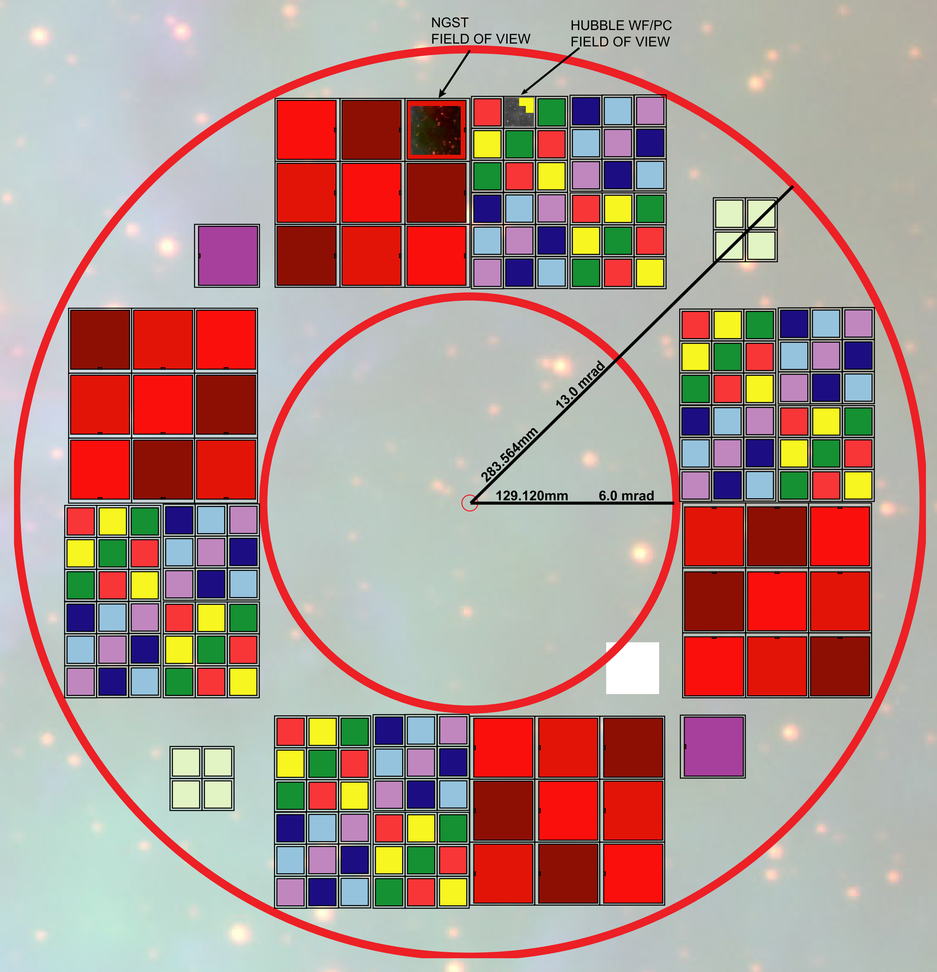
SNAP will survey 20 square degrees in 10 filters from 350-1700 nm. In a single scan SNAP will reach magnitude R=28.8, achieving m(AB)=31.6 for coadded images. The sky coverage is 13000 times the area of the Hubble Deep Field and 6300 times that of the Hubble ACS, to about the same resolution and the HDF depth. Combining high accuracy multiband photometry with a deep, wide field will revolutionize many areas of study in astronomy and astrophysics.

Time domain survey

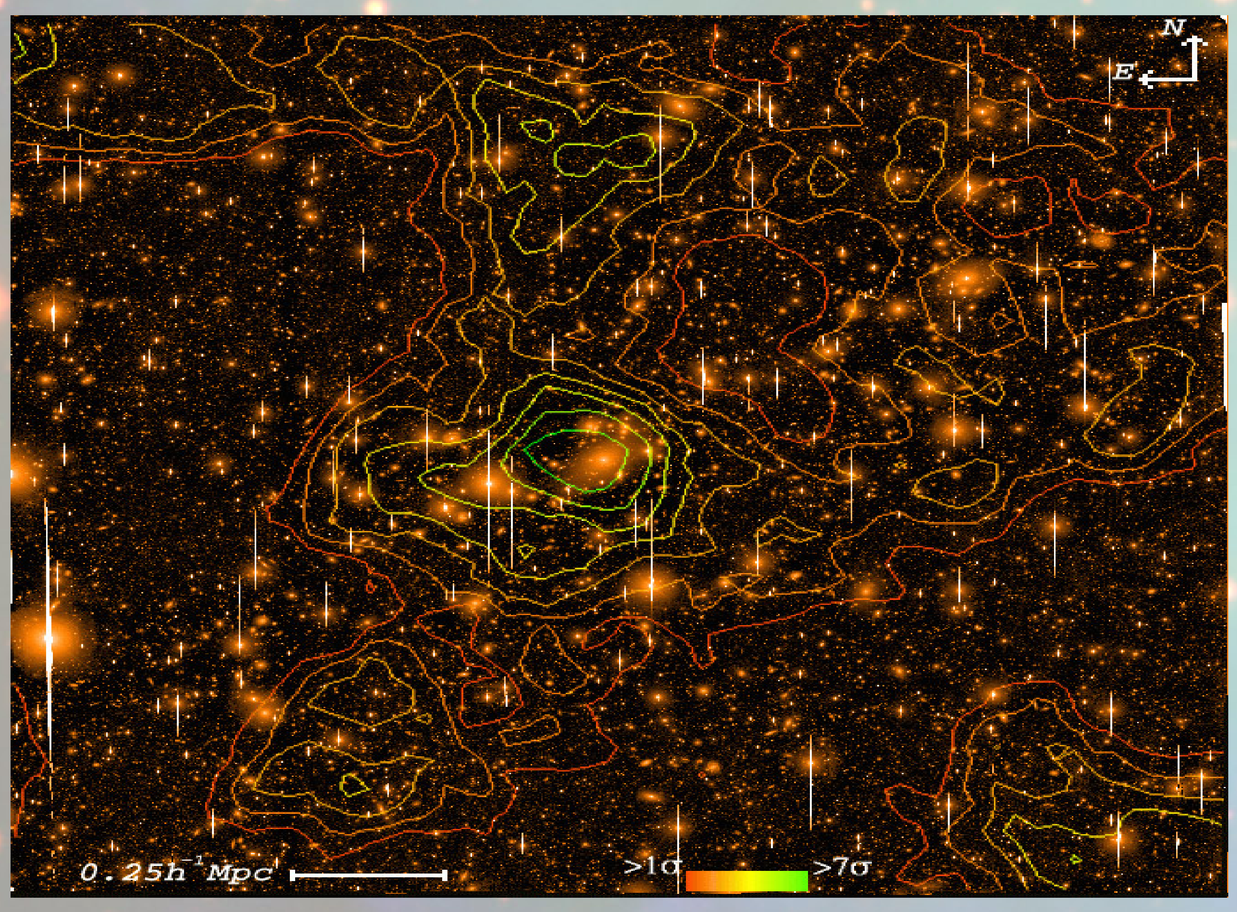
SNAP explores valuable parameter space in the time domain as well. Repeatedly scanning fields in a 4 day cadence (and 300 sec dither), SNAP will mine the sky for proper motion, transient, and rare objects, offering a bonanza for solar system, stellar, and galactic structure and dynamics studies. For cosmology the time domain reveals supernovae of various types to redshifts of z~2 and gamma ray burst afterglows possibly to z=10-15.

Synergy with NGST

SNAP is not only a powerful observatory in itself, but its wide field imager can act in synergy with NGST's excellent targeted capabilities for high resolution and deep spectroscopy. In this way each instrument's expertise and efficiency multiplies the science productivity and reach.



SNAP focal plane tiled with 144 optical CCDs and 38 near infrared HgCdTe detectors - the largest astronomical imager ever.



Weak lensing mass map overlaid on R band image of A3667 — *Joffre et al. 2000*

Supernovae and Dark Energy:

By repeatedly imaging 20 square degrees of the sky, SNAP in a year will discover ~2500 Type Ia supernovae just after they explode, and accurately measure complete multiband lightcurves and a spectrum for each one. This rich stream of data allows detection and correction of systematic effects including supernova properties, host environments, and intervening dust. Construction of a Hubble diagram (magnitude-redshift relation) out to z=1.7 with errors less than 0.02 mag probes dark energy models, including deviations from a cosmological constant and time variation of the equation of state.

Weak Gravitational Lensing:

A weak lensing survey covering hundreds of square degrees adds further leverage to the precision cosmology program. The stability of the point spread function in space is a key advantage for accurate measurement of dark matter induced image shear. Maps of the total mass distribution over large areas of the sky provide a rich resource for many galactic, cluster, and cosmology studies including bias, evolution, and nongaussianity.

Astronomy with SNAP

- Galaxy structure, populations, and evolution
- Stellar distributions, populations, and evolution
- Star formation, starbursts, multicolor mapping
- Solar system studies
- Gamma ray burst afterglows
- Transient objects

Cosmology with SNAP

- Type Ia Supernovae
- Weak lensing - hundreds of square degrees survey
- Strong lensing
- Type II Supernovae - expanding atmosphere method
- Galaxy correlation function and evolution
- Rare objects

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The Dumbell Nebula, taken with the LBNL CCD on the WIYN Telescope. Image from NOAO/AURA/NSF. Copyright WIYN Consortium, Inc., all rights reserved.